STUDY ON THE GLACIERS OF THE WESTERN MONGOLIA USING PALSAR DATA

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ABSTRACT:

Since the middle of the last century, the global climate is changing drastically and as a result the current climate experiences more frequent extremes in Mongolia causing big losses amongst animal and land degradation. Southern and Northern pole and ice glaciers is melting caused by the Global World warming. Because of it, negative effects on world climate are viewing by losing ecological equilibrates. Thus we aimed to explained the relationship World Global warming with changes glacier fields in Great Lakes Basin in the Western part of Mongolia by using satellite data. The ALOS/PALSAR data was used for glacier depth in the study area Deglii Tsagaan UUL. The study area is surrounded by mountainous with high glaciers. From this research we conlude that ALOS/PALSAR data could be used not only for glacier depth study but can be also applied for glacier change detection and snow coverage of Western Mongolia.

1. INTRODUCTION

Mongolia is high mountain land that has including glacier are located Khuiten and Altai Tavan Bogd summit of Mongol Altai mountainous areas which has chilly and breeze climate. One of biggest river is located at the Mongol Altai mountainous areas which is named by Potanin river's area is 53.5 square kilometers.

Last years global has climate change that important impact of environment. Mongolia is harsh climare country which is long lasting cold winter, short and hot summer (high temperature variability: -350C in winter, +350C in summer). The climate in the northern part of the country is extremely cold, in winter the temperature can reach -500C extreme continental climates with low precipitation, 85-90% of which fall in summer as rain. During the last 64 years Annual air temperature increased an average by 1.90C in Mongolia. Winter warming is more in the high mountain regions (3.0-4.50C), and less in the steppe and Gobi and desert (1.0-2.00C).

Climate change impact had decreased time and period to sneeze of glacier, melt of glacier and to shrink depth of glacier.
Glacier research and study has not coverage by Mongolian all territory but those research is just particle or small study area. That study not covered by the Western Mongolia and just some peak of mountainous areas. Because all areas study is limited by financial support and geography location is far from capital.

Therefore this studies one purpose is used space technology such as satellite images to identify area of glacier and their depth.
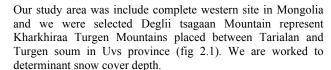
2. APPROACHES

2.1 Study area

Our study area was include complete western site in Mongolia and we were selected Deglii tsagaan Mountain represent Kharkhiraa Turgen Mountains placed between Tarialan and Turgen soum in Uvs province (fig 2.1). We are worked to determinant snow cover depth.

Figure 2.1. Deglii tsagaan mountain

2.2 Data used

ALOS/PALSAR is active sensor for radar remote sensing and refinement version of Synthetic Aperture Radar (SAR) for JERS-1 satellite in Japan. ALOS/PALSAR data distributed since 2007 to public. And we found used data in our study area situated that's very difficult. This data located in Kharkhira Turgen mountains (fig 2.2).

Figure 2.2. Our study area and data locate

2.3 Method

First one We had need radiometric calibration relation with specially our study area and estimate quantity on the original data of PALSAR (fig 2.3).
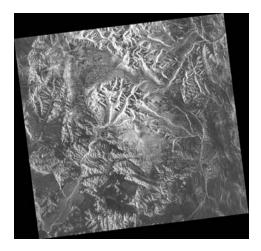

Figure 2.3. ALOS/PALSAR original data /2007/09/18/

Radiometric calibration setup is displayed fig 2.4. Further we determinant snow cover depth on land surface. Therefore we need perpendicular to this surface with scattering ray contain informations. So we using padar ray the surface perpendicular projection (eq.1).

$$DN_C = DN * \cos(\theta - \phi) \tag{1}$$

Were: φ – main angle of oblique surface,
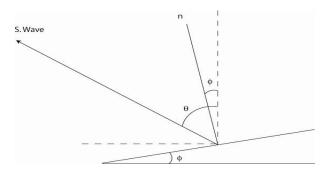θ- Radar ray insident angle

Figure 2.4. Radiometric calibration setup.

Next one, This calibration and refinement finished then the Backscattered Coefficient calculation by eq.(2). This coefficient is contained surface depth information. The coefficient is main parameter contained depth information for radar data (fig 2.5). The coefficient found by Eq.(2) is direct related with snow cover depth the surface. Eq.(3) contianed α- coefficient will be determane to using in-situ data. Eq.(2) is calculated by simulation method relation the surface properties.

$$\sigma^0 = 20\log(DN / DN_{max}) \ / Tetuko \ 2002 / \tag{2}$$

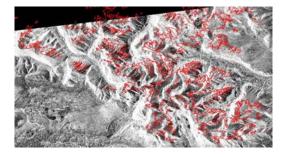$$\sigma^0 = \alpha \, h \tag{3}$$

Figure 2.5. Figure of Backscattered Coefficient the Deglii Tsgaan Mountain around

Snow cover depth illustrate to classification by figure of Backscattered coefficient.

3. RESULTS

ALOS/PALSAR data using glassier thickness determane model demonstrate. This model using exact study area Kharkhiraa Turgen Mountains. Snow cover depth illustrate (fig 3.2).
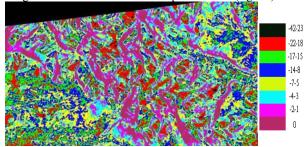

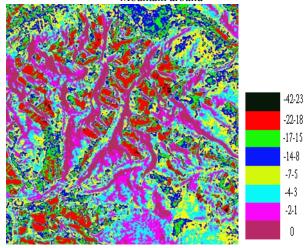Figure 3.1 Illustrate of Snow cover depth the Deglii Tsgaan Mountain around

Figure 3.2. Snow cover depth illustrate Kharkhiraa Turgen Mountains.

4. CONCLUSSIONS

We have following conclusions after this case study's results:

- Snow and ice depth calculated by Backscattered Coefficient and its helpful and easy to detect snow and ice depth.
- This approach has to check ground truth data and to compare with results thematic maps.
- To provide to users application of ALOS/PALSAR data
- Results of this research comparing to Mongolian climate and weather change data, throughly compare to global dataset.
- To extend research of study area especially data of winter season and high snow fall season.
- To create database and metadata about glacier research and case study, then share others researcher, projects and organisers.

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